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PERFORMANCE ORIENTED PACKAGING
OF
M2A1 AMMUNITION BOX
FOR
PACKING GROUP II
SOLID HAZARDOUS MATERIALS

BY:

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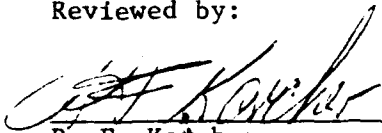
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INTRODUCTION

The M2A1 Ammunition Box was tested to ascertain whether the container would meet the requirements of Performance Oriented Packaging (POP) as specified by the United Nations Recommendations on the Transport of Dangerous Goods Document, ST/SG/AC.10/1, Revision 6, Chapters 4 and 9. A base level vibration test was also conducted in accordance with the rulings specified by the Department of Transportation Performance Oriented Packaging Standards, 49 CFR Part 106 et al. Federal Register/Vol. 56, No. 245/Friday, December 20, 1991/Rules and Regulations. The objectives were to evaluate the adequacy of the container in protecting Packing Group II solid hazardous materials.

The M2A1 box is made of steel and has a hinged lid with a handle on top. The box is shown in Figure 1.

TESTS PERFORMED

1. Drop Test

This test was performed in accordance with ST/SG/AC.10/1, Chapter 9, Paragraph 9.7.3. Five containers were used during the test series, one for each drop. The drop height was 1.2 meters and the drop sequence was as follows:

- a. Flat on Bottom
- b. Flat on Top
- c. Flat on Long Side
- d. Flat on Short Side
- e. On a Corner

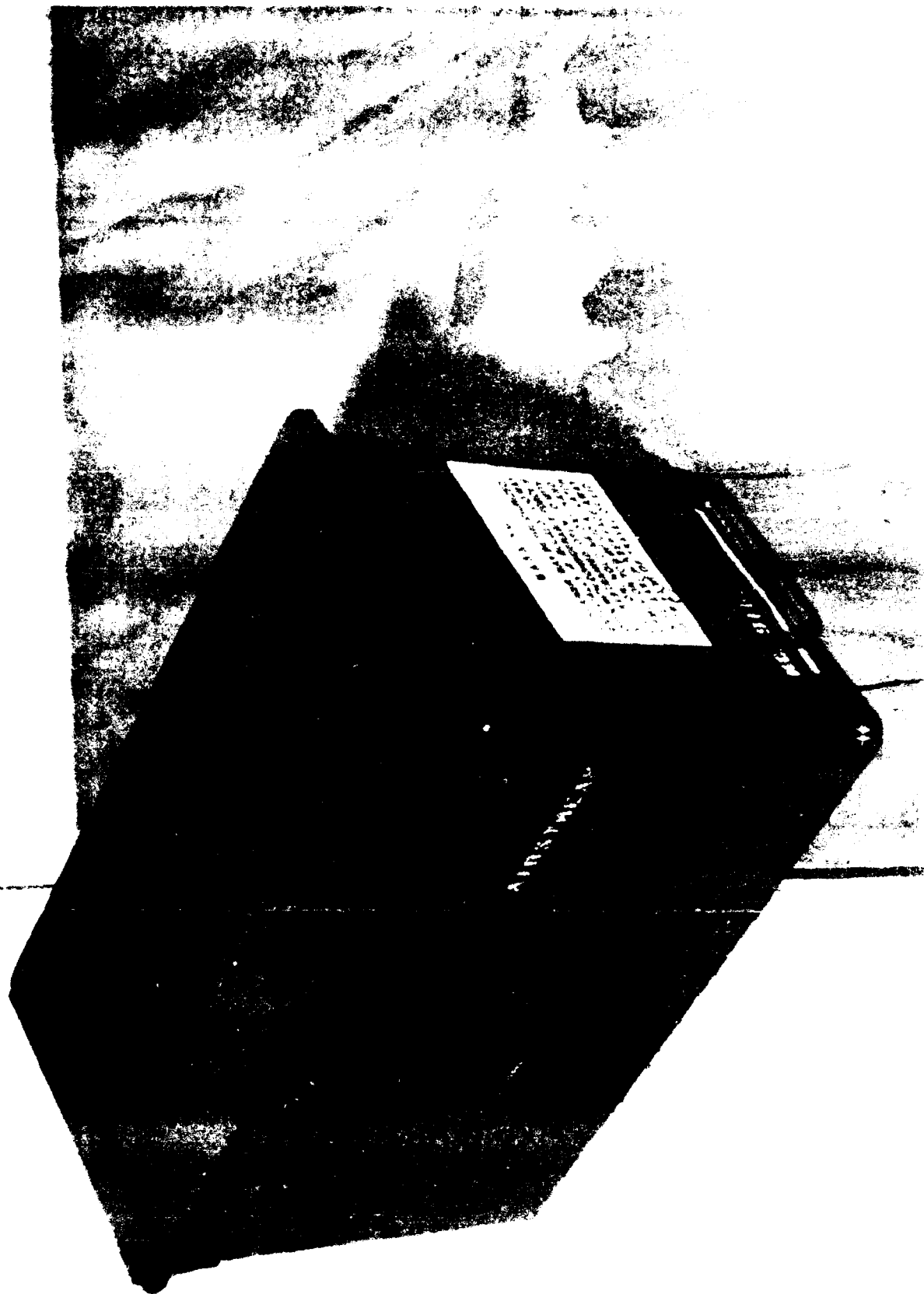
The test was performed at ambient temperature ($70^{\circ} + 20^{\circ}\text{F}$). The contents of the container should be retained within its packaging and exhibit no damage liable to affect safety during transport.

2. Stacking Test

This test was performed in accordance with ST/SG/AC.10/1, Chapter 9, Paragraph 9.7.6. Three different containers were used, each with a stack weight of 830 pounds. The test was performed for 24 hours. After the allowed time, the weight was removed and the container examined. Any leakage, deterioration, or distortion which could adversely affect transport or reduce its strength or cause instability in stacks of packages is cause for rejection.

3. Base Level Vibration Test

This test was performed in accordance with the Federal Register/Vol 55, No. 246/Friday, December 21, 1990/Final Rule. Three sample containers were loaded with steel weights and closed as for shipment. Each container was placed on a vibrating



platform that had a vertical double-amplitude (peak-to-peak displacement) of one inch. The packages were constrained horizontally to prevent them from falling off the platform, but were free to move vertically, bounce and rotate. The test was performed for one hour at a frequency that caused each point of the container bottom to be raised from the platform to such a degree that a 1.6mm thick metal strip could be passed between the bottom of any package and the platform.

PASS/FAIL (UN CRITERIA)

The criteria for passing the drop test is outlined in Paragraph 9.7.3.5 of ST/SG/AC.10/1 and states the following: "Where a packaging for solids undergoes a drop test and its upper face strikes the target, the test sample passes the test if the entire contents are retained by an inner packaging or inner receptacle (e.g., a plastic bag), even if the closure is no longer sift-proof".

The criteria for passing the stacking test is outlined in Paragraph 9.7.6.3 of ST/SG/AC.10/1 and states the following: "No test sample should show any deterioration which could adversely affect transport safety or any distortion liable to reduce its strength or cause instability in stacks of packages".

PASS/FAIL (FEDERAL REGISTER CRITERIA)

The criteria for passing the Base Level Vibration Test is outlined in the Federal Register/Vol. 56, No. 245/Friday, December 20, 1991/Rules and Regulations and states the following: "Immediately following the period of vibration, each package shall be removed from the platform, turned on its side and observed for any evidence of leakage. A packaging passes the vibration test if there is no rupture or leakage from any of the packages. No test sample should show any deterioration which could adversely affect transportation safety or any distortion liable to reduce packaging strength."

TEST RESULTS

1. Drop Test

Satisfactory.

2. Stacking Test

Satisfactory.

3. Base Level Vibration Test

Satisfactory.

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DISCUSSION

1. Drop Test

After each drop the container was inspected for any damage which would be cause for rejection. Final inspection revealed minor damage to the boxes, but no spillage of contents.

2. Stacking Test

Three containers were individually tested. Each container was visibly inspected after the 24-hour period was over. There was no leakage, distortion, or deterioration to the container as a result of this test.

3. Base Level Vibration Test

Immediately following the vibration test, each container was removed from the platform, turned on its side and observed for any evidence of leakage. All latches remained fastened and there was no evidence of leakage of contents.

REFERENCE MATERIAL

United Nation's "Recommendations on the Transport of Dangerous Goods", ST/SG/AC.10/1, Revision 6

Department of Transportation Performance Oriented Packaging Standards, 49 CFR Part 106 et al. Federal Register/Vol. 56, No. 245/Friday, December 20, 1991/Rules and Regulations

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DATA SHEET

CONTAINER:

M2A1 Ammunition Box

Type: 4A1

UN Code: See Table I

Specification Number:
Drawing 19200-7553296

Material:
Steel

Gross Weight:
15.0 kg
(33.0 pounds)

Dimensions:
.30m L x .15m W x .19m H
(12.00" L x 6.09" W x 7.50" H)

Closure (Method/type):
Latch (1 ea.)

Tare Weight:
2.4 kg
(5.2 pounds)

Additional Description: Box was constructed in accordance
with drawing 19200-7553296.

PRODUCTS:

See Table I

Proper Shipping Name: See Table II

United Nations Number: See Table I

United Nations Packing Group: II

Physical State: Solid

Amount Per Container: See Table I

Net Weight: Varies

TEST PRODUCT:

Name: Steel rods

Physical State: Solid

Size: .11m L x .02m Dia
(4.50" L x 1.00" Dia)

Quantity: 27

Dunnage: Foam polyethylene, PPP-C-1752

Gross Weight: 15.0 kg (33.0 lbs.)

TABLE I

DODIC OR NALC	NSN	ITEM	TYPE	PACKING DRAWING	HAZ. CL.	UN NO.	# CNTR.	PER WT	GROSS (KG)
2W89	1370-01-239-9544	MJU-8A/B	FLARE	2816235	1.3G	0093	21	9.0	
3W92	1370-01-251-5792	MK137-0	SIGNAL	6537416			12	4.5	
LW60	1370-01-032-7028	MK46-1C	FLARE	2816235	1.3G	0093	21	9.0	
LW62	1370-01-041-2629	MJU-8/B	FLARE	2816235	1.3G	0093	21	9.0	
L161	1370-01-252-0318	MK131-0	SIGNAL	6263403			10	6.3	
L273	1370-01-177-4072	MK99-3	SIGNAL	6118534	1.4G	0191	5	6.0	
L451	1370-01-252-0317	MK132-0	SIGNAL	6263400			10	6.1	
M862	1377-00-806-4886	S-75	SQUIB	2128480	1.4S	0454	500	4.0	
M996	1375-01-069-6671	MK87-0	CHARGE		1.1D	0048	5	11.0	
M997	1375-01-068-3984	MK88-0	CHARGE	5206288	1.4D	0410	5	8.5	
MW86	1375-01-020-8907	MK48-0	DEVICE	3192610	1.4S	0367	2	4.9	
N250	1390-00-451-8695	MK342-1	FUZE	2513109	1.4S	0349	8	8.2	
N259	1390-00-563-7712	MK393-0	FUZE	2513109	1.2D	0409	8	7.7	
N457	1390-01-146-7620	MK417-0	FUZE	2513109	1.2D	0409	8	10.4	
N458	1390-00-488-3993	MK404-0	FUZE	2513109	1.2D	0409	8		
N618	1390-01-043-1683	MK407-1	FUZE	2513109	1.2D	0409	8	10.4	
N670	1390-01-178-8609	MK418-0	FUZE	2513109	1.2D	0409	8	10.0	

TABLE II

UN SERIAL NUMBER	PROPER SHIPPING NAME
0048	CHARGES, DEMOLITION
0093	FLARES, AERIAL
0191	SIGNAL DEVICES, HAND
0349	ARTICLES, EXPLOSIVE, N.O.S.
0367	FUZES, DETONATING
0409	FUZES, DETONATING
0410	FUZES, DETONATING
0454	IGNITERS